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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/654,306

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Hiroyuki Tamura

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EXAMINER

REAMES, MATTHEW L

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/654,306	<b>Applicant(s)</b> TAMURA ET AL.	
	<b>Examiner</b> MATTHEW L. REAMES	<b>Art Unit</b> 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/5/2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,4-8 and 13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4-8 and 13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-8, and 12 are rejected under 35 U.S.C. 102(b) as being Tamura by Phys. Rev. B Feb 2002).

a. As to claims 1,4-8, Tamura teaches a magnetic body composed of non-magnetic material (see abstract) comprising a plurality of localized electron regions in each of which at least one electron is confined to form a localized spin (see section IV); a barrier potential region having a higher energy than the Fermi energy of the electron in the localized region and confining the electron within the respective localized electron regions (see section IV); a conductive electron region including a conductive electron system having a lower energy than an energy of the barrier potential region (see section V); wherein the localized respective localized electron regions are disposed separate from one another via the barrier potential region and conductive region to show ferromagnetism based on an interaction between localized spins through the conductive electron region ( see abstract and section IV). Tamura further teaches quantum dot (see abstract). Tamura further teaches a GaAs InAs and Si quantum dot of 5 nm further through biasing the gate the Fermi wavelength can be modified as

desired. Regarding claim 3-8, the manner of operating the device does not differentiate an apparatus claim from the prior art. A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) See MPEP §2114. The recitation of “Fermi wavelength” and “permitting a fluctuation” is an intended use language which does not differentiate the claimed device from the prior art device of Tamura, who teaches the structure of the claim as described above. Further, Tamura teaches the gate voltage may affects the size of the quantum dot (see e.g. fig. 5 and last paragraph 1<sup>st</sup> column of page 05324-5). Therefore depending on the gate voltage, the device can permit a fluctuation as claimed in claim 1. Voltage is not a structural feature of the device. Since the device is capable of performing the feature claimed it therefore reads on the structure.

. If the prior art structure is capable of performing the intended use, then it meets the claim requirements. See, e.g., *In re Pearson*, 18 1 USPQ 641 (CCPA); *In re Minks*, 169 USPQ 120 (Bd Appeals); *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); See MPEP §2114. The recitation of “permitting a size fluctuation”, does not distinguish the present invention over Tamura who teaches the structure as claimed and the capability of performing said function.

- b. As to claim 12, Tamura teaches a semiconductor quantum dot.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 9 and 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tamura.

- a. As to claim 9, Tamura does not explicitly teach the width of the barrier layer as claimed.

However it would have been obvious to one of ordinary skill in the art at the time of the invention to have optimized the barrier width to less than half of a length subtracting the size of the quantum dot along the direction in which electrons are confined.

One would have been so motivated to optimize tunneling from the conductive region into the dots.

"[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C

and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%.); see also Peterson, 315 F.3d at 1330, 65 USPQ2d at 1382 (“The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.”); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969) (Claimed elastomeric polyurethanes which fell within the broad scope of the references were held to be unpatentable thereover because, among other reasons, there was no evidence of the criticality of the claimed ranges of molecular weight or molar proportions.). For more recent cases applying this principle, see Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and In re Geisler, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997).

b. As to claim 13, Tamura teaches all the elements of claim 1 and all the elements of claim 13 except Tamura does not teach a an insulation layer.

However it would have been obvious to one of ordinary skill in the art at the time of the invention to separate the gate from the region, as required by Tamura (pg 085324-1 column 2) by using a insulation layer such as silicon oxide.

One would have been so motivated since insulator as silicon oxide where conventional in the semiconductor art and would have therefore provided a cost benefit.

The Examiner notes that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See, e.g., *In re Pearson*, 18 1 USPQ 641 (CCPA); *In re Minks*, 169 USPQ 120 (Bd Appeals); *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); See MPEP §2114. The recitation of “permitting a fluctuation”, does not distinguish the present invention over Tamura who teaches the structure as claimed.

### ***Response to Arguments***

In regards to Applicants suggestion that Tamura s teaches a “high precision lattice structures” (i.e. no fluctuations in the lattice structure), Tamura recites no such statement. Further, Tamura’s system is a quantum mechanical system, these systems are well known for the fluctuations occur for example Tamura explicitly mentions on page 085324-6 that fluctuations occur I the spin-spin correlation function due to thermal excitations. Further Applicant invention is directed toward a lattice structure (see first paragraph of applicant’s summary of invention), so it unclear how the structure of Tamura is different.

The claim requires that it be permitted to fluctuate in the region. Tamura teaches the device can modify the size of the dots (see page 085324-5), which is a fluctuation in size. Further, it is clear that Tamura system will fluctuate due to thermal excitations. In either case the device of Tamura is capable of allowing fluctuations of the magnitude claimed depending on the confinement energy (gate voltage). Therefore the fluctuation is being interpreted as an intended use of the device. The Examiner notes that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See, e.g., *In re Pearson*, 18 1 USPQ 641 (CCPA); *In re Minks*, 169 USPQ 120 (Bd Appeals); *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963); See MPEP §2114. The recitation of "permitting a size fluctuation", does not distinguish. Applicant has provided no evidence to the allegation that the device cannot perform the claimed function. Therefore since the size of the quantum dot depends on the gate voltage and fluctuations depend on the voltage strength and frequency a *prima facie* showing of inherency has been provided. Applicant has provided no evidence to the allegations that it cannot perform the function claimed.

Applicant further argues that Tamura does not teach a conductive region. This is not found convincing since applicant admits that in figure 6 there conductive region is a 2-DEG which is the same as Tamura.



Applicant further argues a RKKY interaction. However this is non-commensurate with the scope since an RKKY interaction is never claimed. Further if the structure is capable of performing the function it meets the claim limitations.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW L. REAMES whose telephone number is (571)272-2408. The examiner can normally be reached on M-Th 6:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. William Baumeister can be reached on (571)272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MLR/

/BRADLEY W BAUMEISTER/  
Supervisory Patent Examiner, Art Unit 2891